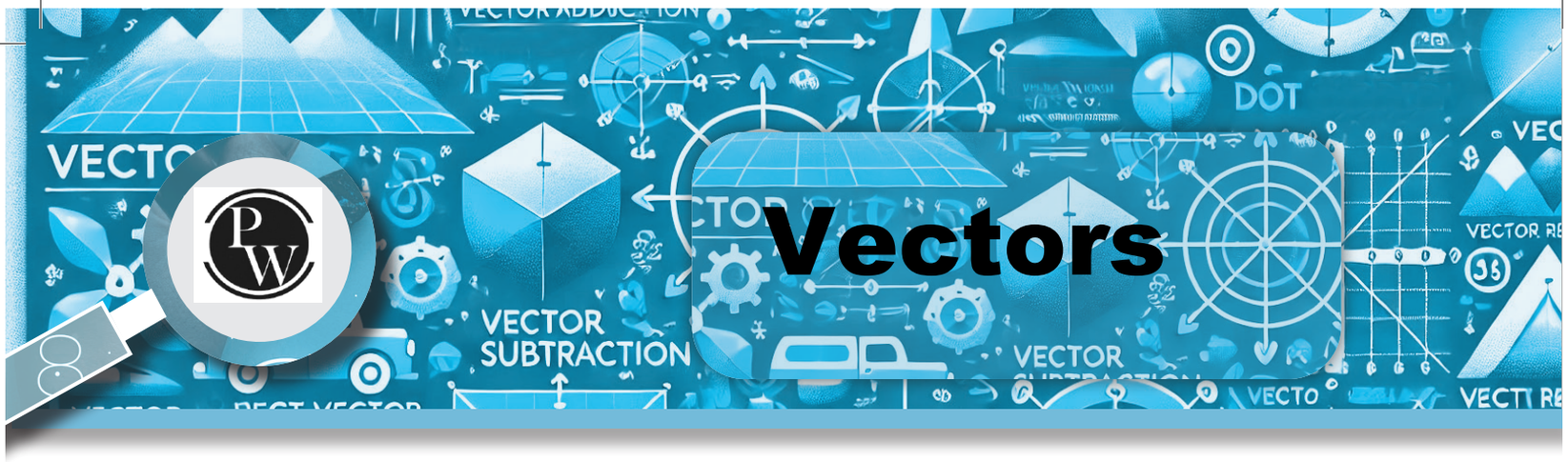


Vectors

Vector and Scalar

1. Which of the following is vector?

(*a*) Electromotive force (*b*) Surface Tension

(*c*) Weight (*d*) Focal length

2. Which of the following representation is correct?

(*a*) Work ($\vec{w}$) (*b*) Force (F)

(*c*) Energy (E) (*d*) None of these

3. A. Physical quantity which (does not have direction) must be scalar

B. Physical quantity which have direction must be vector.

(*a*) Both are true (*b*) Both are false

(*c*) A true B false (*d*) A false B true

4. Which one of the following statements is true ?

(*a*) A scalar quantity is the one that is conserved in a process.

(*b*) A scalar quantity is the one that can never take negative values.

(*c*) A scalar quantity is the one that does not very from one point to another in space.

(*d*) A scalar quantity has the same value for observers with different orientations of the axes.

Types of Vector

5. Fill in the blank, by magnitude and angle for a given type of vector.

Vector Types	Magnitude	(Direction) Angle
(i) Equal vector	.....	.....
(ii) Orthogonal vector	.....	.....
(iii) Parallel Vector	.....	.....
(iv) Anti parallel vector	.....	.....

6. Which of the following is unit vector

(*a*) $\sin\theta\hat{i} - \cos\theta\hat{j}$ (*b*) $\frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j}$

(*c*) $\hat{i} - \hat{j}$ (*d*) Both (*a*) and (*b*)

7. The Expression $\left(\frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j}\right)$ is a

(*a*) Unit Vector (*b*) Null vector

(*c*) Vector of Magnitude $\sqrt{2}$ (*d*) scalar

Resolution of Vector

8. A vector in *x*-*y* plane makes an angle of 30 degree with y-axis and magnitude of component of vector is $2\sqrt{3}$ The magnitude of component *y* vector will be:

(*a*) $\sqrt{3}$ (*b*) 2 (*c*) 6 (*d*) $\frac{1}{\sqrt{3}}$

Rotation of Vector

9. The vector $\overrightarrow{OA}$ where O is origin is given by $\overrightarrow{OA} = 2\hat{i} + 2\hat{j}$ Now it is rotated by 45°anticlockwise about O. What will be the new vector?

(*a*) $2\sqrt{2}\hat{j}$ (*b*) $2\hat{j}$ (*c*) $2\hat{i}$ (*d*) $2\sqrt{2}\hat{i}$

10. A vector $\vec{A} = 2\hat{i}$ rotated by 90° then new vector becomes

(*a*) $2\hat{i}$ (*b*) $2\hat{i} + 2\hat{j}$ (*c*) $2\hat{j}$ (*d*) $\sqrt{2\hat{i}} + \sqrt{2\hat{j}}$

Magnitude and Direction of Vector

11. Find Magnitude of Vector

(i) $2\hat{i} + 3\hat{j}$ (ii) $3\hat{i} + 4\hat{j}$

(iii) $3\hat{i} + 4\hat{j} + 5\hat{k}$ (iv) $\hat{i} + \hat{j} + \hat{k}$

(v) $6\hat{i} - 8\hat{j} + 10\hat{k}$ (vi) $10\hat{i} + 10\hat{j} - 10\hat{k}$

12. Find magnitude of Vector

(i) $2\hat{i} + 2\hat{j} + 2\hat{k}$ (ii) $3\hat{i} - 4\hat{j} + 5\hat{k}$

(iii) $7\hat{i} - 24\hat{j} + 25\hat{k}$ (iv) $10i + 10j$

(v) $5\hat{k} + 12\hat{j}$ (vi) $\sqrt{2}\hat{i} + \sqrt{2}\hat{j}$

(vii) $i - j + \hat{k}$ (viii) $6i - 8j + 10\hat{k}$

(ix) $i + \sqrt{3}j + 2\hat{k}$

13. If $\vec{A}$ maxing an angle α,β and γ with x- axis, y- axis & z- axis respectively then find $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$

14. $\vec{A} = 10\hat{i} + 10\hat{j}$ find Angle between $\vec{A}$ & x -axis ??

(a) 45° (b) 30° (c) 60° (d) 0°

15. The angles which a vector $\hat{i} + \hat{j} + \sqrt{2}\hat{k}$ makes with X, Y and Z axes respectively are

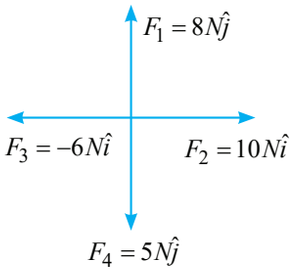
(a) 60°, 60°, 60° (b) 45°, 45°, 45°

(c) 60°, 60°, 45° (d) 45°, 45°, 60°

16. Given $\vec{A} = 2\hat{i} + 3\hat{j}$, the angle between $\vec{A}$ and Y -axis is

(a) $\sin^{-1}\frac{2}{3}$ (b) $\cos^{-1}\frac{2}{3}$ (c) $\tan^{-1}\frac{2}{3}$ (d) $\tan^{-1}\frac{3}{2}$

17. Find $\vec{F_1} + \vec{F_2} + \vec{F_3} + \vec{F_4} = ?$



(a) $2\hat{i} + 3\hat{j}$ (b) $4\hat{i} + 3\hat{j}$ (c) $4\hat{i} + 2\hat{j}$ (d) $\hat{i} + 3\hat{j}$

18. Two vectors $\vec{A} = 6\hat{i}$ and $\vec{B} = 8\hat{j}$ then find $\vec{A} + \vec{B}$, direction of $\vec{A} + \vec{B}$ from $\vec{A}$.

19. If $\vec{A} = 2\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{B} = \hat{i} + \hat{j} + 2\hat{k}$ then find vector $\vec{C}$ magnitude same as $\vec{A}$ and direction along $\vec{B}$.

20. $\vec{A} = 4\hat{i} + 3\hat{j}$ and $\vec{B} = 4\hat{i} + 2\hat{j}$. Find a vector parallel to $\vec{A}$ but has magnitude five times that of $\vec{B}$.

(a) $\sqrt{20}(2\hat{i} + \hat{j})$ (b) $\sqrt{20}(4\hat{i} + 3\hat{j})$

(c) $\sqrt{20}(2\hat{i} + \hat{j})$ (d) $\sqrt{10}(2\hat{i} + \hat{j})$

21. The component of vector $A = a_x\hat{i} + a_y\hat{j} + a_z\hat{k}$ along the direction of $\hat{i} - \hat{j}$ is

(a) $a_x - a_y + a_z$ (b) $a_x - a_y$

(c) $(a_x - a_y)/\sqrt{2}$ (d) $(a_x - a_y + a_z)$

22. $\vec{A}$ makes equal angles with X, Y, and Z -axes. Value of its components in terms of magnitude of $\vec{A}$ will be

(a) $\frac{A}{\sqrt{3}}$ (b) $\frac{A}{\sqrt{2}}$

(c) $\sqrt{3}A$ (d) A

23. A person pushes a box kept on a horizontal surface with force of 100 N. In unit vector notation, force $\vec{F}$ can be expressed

(a) $100(\hat{i} + \hat{j})$ (b) $100(\hat{i} - \hat{j})$

(c) $50\sqrt{2}(\hat{i} - \hat{j})$ (d) $50\sqrt{2}(\hat{i} + \hat{j})$

Draw Vector

24. Draw given vector $\vec{A} = 2\hat{i} - 2\hat{J}$, $\vec{B} = -3\hat{i} - 4\hat{j}$, $\vec{C} = -3\hat{i} + 3\hat{j}$

25. $\vec{A} = 5\hat{i} + 10\hat{j}$ draw and write with direction

26. Velocity of object 10m/s at 30° North of East. Draw in vector form.

27. $\vec{B} = +3\hat{i} - 4\hat{j}$ draw & write with direction?

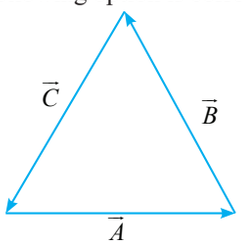
Vector Addition

28. A set of vectors taken in a cyclic order gives a close polygon, then resultant of these vector is:

(a) Unit vector (b) Null vector

(c) Axial vector (d) Parallel vector

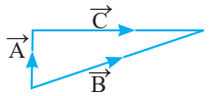
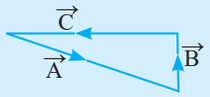
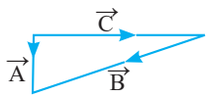
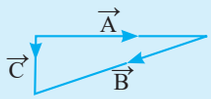
29. Which of the following option is correct for given figure?



(a) $\vec{A} = \vec{B} + \vec{C}$ (b) $\vec{B} = \vec{A} + \vec{C}$

(c) $\vec{C} = \vec{A} + \vec{B}$ (d) $\vec{A} + \vec{B} + \vec{C} = \vec{0}$

30. Match the following:

	List-I		List-II
a.	$\vec{C} - \vec{A} - \vec{B} = 0$	(i)	
b.	$\vec{A} - \vec{C} - \vec{B} = 0$	(ii)	
c.	$\vec{B} - \vec{A} - \vec{C} = 0$	(iii)	
d.	$\vec{A} + \vec{B} = -\vec{C}$	(iv)	

31. Two vectors of magnitude 3 and 4 acting at different angle as given below

(i) 0° (ii) 60°

(iii) 90° (iv) 120°

(v) 180°

Then find resultant.

32. Two forces of magnitude 8 N and 15 N respectively act at a point. If the resultant force is 17 N, the angle between the forces has to be

(a) 60° (b) 45° (c) 90° (d) 30°

33. Three forces given by vectors $2\hat{i}+2\hat{j};+2\hat{i}-2\hat{j}$ and $-4\hat{i}$ are acting together on a point object at rest. The object moves along the direction

(*a*) *x*-axis (*b*) y-axis

(*c*) *z*-axis (*d*) Object does not move

34. Two vector of magnitude 2 then resultant of these two vector may be?

(*a*) 2 (*b*) 8 (*c*) 5 (*d*) 6

35. If $\vec{R}=\vec{A}+\vec{B}$ and $R = A + B$ then angle between $\vec{A}$ and $\vec{B}$ must be

(*a*) 90° (*b*) 60°

(*c*) 0° (*d*) 180°

36. Which of the following relation is correct between $\vec{A},\vec{B}$ and $\vec{C}$ if $\vec{C}=\vec{A}+\vec{B}$

(*a*) $B + A < C < B - A$ (*b*) $A \le C \ge B$

(*c*) $A - B \le A + B$ (*d*) $A - B < C < A + B$

37. Two forces of 10 N and 6 N act upon a body. The direction of the forces are unknown. The resultant forces on the body may be

(*a*) 15N (*b*) 3 N

(*c*) 17 N (*d*) 2N

38. A force of 6 N and another of 8 N can be applied to produce the effect of a single force equal to.

(*a*) 1N (*b*) 10N

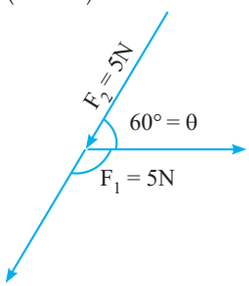
(*c*) 16N (*d*) 0N

39. Two force 5 N and 2 N acting on the object then net force on object must not be

(*a*) 2N (*b*) 1N

(*c*) 6N (*d*) Both (*a*) & (*b*)

40. Find net force $\left(\vec{F}_1+\vec{F}_2\right)$



(*a*) 5N (*b*) $5\sqrt{3}N$

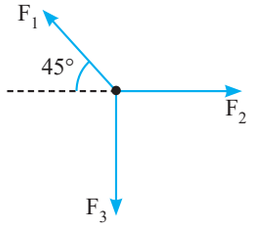
(*c*) $5\sqrt{2}$ N (*d*) 0

41. If angle between $\vec{A}$ and $\vec{B}$ is 60°, then find angle between $\vec{A}$ and $-\vec{B}$ & $-\vec{A}$ and $-\vec{B}$.

(*a*) 30°, 60° (*b*) 120°, 30°

(*c*) 120°, 60° (*d*) 120°, 120°

42. Three forces $\vec{F}_1,\vec{F}_2$ and $\vec{F}_3$ are represented as shown, Each of them is of equal magnitude.



Column-I (Combination)		Column-II (Approximate Direction)	
(A)	$\vec{F}_1+\vec{F}_2+\vec{F}_3$	(p)	
(B)	$\vec{F}_1-\vec{F}_2+\vec{F}_3$	(q)	
(C)	$\vec{F}_1-\vec{F}_2-\vec{F}_3$	(r)	
(D)	$\vec{F}_2-\vec{F}_1-\vec{F}_3$	(s)	

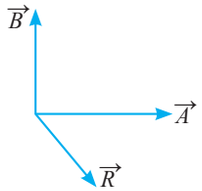
(*a*) A→R, B→Q, C→P, D→S

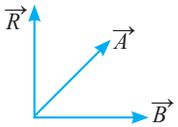
(*b*) A→Q, B→P, C→R, D→S

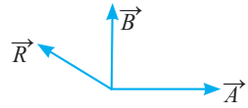
(*c*) A→Q, B→R,C→P, D→S

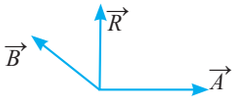
(*d*) A→S, B→P,C→R, D→Q

43. Which of the following diagram is correct for $\vec{A}+\vec{B}=\vec{R}$

(*a*) 

(*b*) 

(*c*) 

(*d*) 

44. Vector $\vec{A}$ is 2 cm long and is 60° above the *x* -axis in the first quadrant. Vector $\vec{B}$ is 2 cm long and 60° below the *x* -axis in the fourth quadrant. The sum $\vec{A}+\vec{B}$ is a vector of magnitude

(*a*) 2 along $+y-$ axis (*b*) 2 along $+x-$ axis

(*c*) 1 along $-x-$ axis (*d*) 2 along $-x-$ axis

45. If vector sum of two unit vector is unit then angle between them is:

(*a*) 90° (*b*) 60° (*c*) 120° (*d*) 0°

46. The ratio of maximum and minimum magnitudes of the resultant of two vectors $\vec{a}$ and $\vec{b}$ is 3 : 1 Now, $|\vec{a}|$ is equal to:

(*a*) $|\vec{b}|$ (*b*) $2|\vec{b}|$ (*c*) $3|\vec{b}|$ (*d*) $4|\vec{b}|$

47. At what angle should the two forces $2P$ and $\sqrt{2}P$ act so that the resultant force is $P\sqrt{10}$?

(*a*) 45° (*b*) 60° (*c*) 90° (*d*) 120°

48. The resultant of $\vec{A}$ and $\vec{B}$ makes an angle α with $\vec{A}$ and β with $\vec{B}$ then correct option is

(*a*) $\alpha > \beta$ (*b*) $\beta < \alpha$

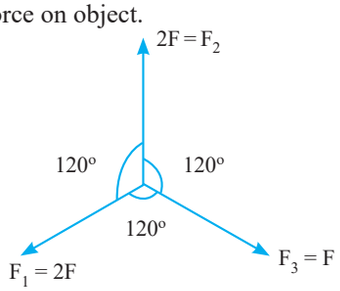
(*c*) $\alpha < \beta$ if A > B (*d*) a = β

49. Four forces of magnitude P, 2P, 3P and 4P act along the four sides of a square *ABCD* in cyclic order. Find the resultant force:

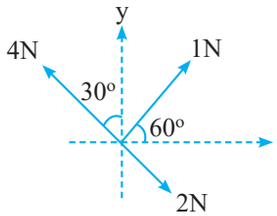
(*a*) 2P (*b*) $3\sqrt{2}P$

(*c*) 0 (*d*) $2\sqrt{2}P$

50. If three force acting on the object as shown in figure. Then find net force on object.



51. Three force acting on the body as shown in figure. To have(resultant force only along *y*-axis, magnitude of minimum additional force needed is?

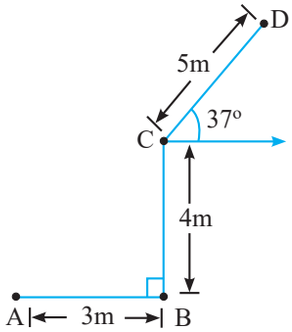


(*a*) $\sqrt{3}$N (*b*) $\frac{\sqrt{3}}{2}$N

(*c*) 1.5 N (*d*) $\frac{1}{2}$N

52. $\vec{A} = 2\hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{B} = 3\hat{i} - 3\hat{j} - 2\hat{k}$, find $\vec{A} - \vec{B}$

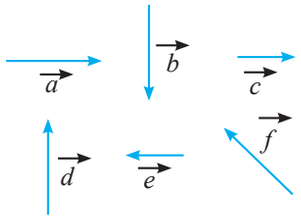
53. A particle moves along a path ABCD as shown in the figure. Then the magnitude of net displacement of the particle from position *A* to *D* is:



(*a*) 10 m (*b*) $5\sqrt{2}$m

(*c*) 9 m (*d*) $7\sqrt{2}$m

54. Six vectors, $\vec{a}$ through $\vec{f}$ have the magnitudes and directions indicates in the figure. Which of the following statements is true?



(*a*) $\vec{b} + \vec{c} = \vec{f}$ (*b*) $\vec{d} + \vec{c} = \vec{f}$

(*c*) $\vec{d} + \vec{e} = \vec{f}$ (*d*) $\vec{b} + \vec{e} = \vec{f}\,\vec{f}$

55. Resultant of two vectors must be in the plane of Two vectors.

(*a*) True (*b*) False

56. Which of the following combination of three force can give zero resultant

(*a*) 2, 4 , 7 (*b*) 3, 1, 5 (*c*) 2, 8 , 11 (*d*) 3, 4, 2

57. A vector $\vec{A} = 2\hat{i} + 3\hat{j} - 4\hat{k}$, then find $-3\vec{A}$ and $\frac{\vec{A}}{2}$.

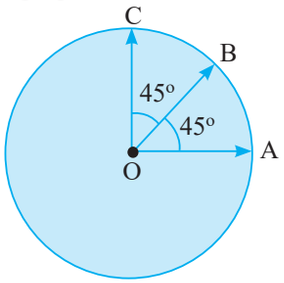
58. The sum of the magnitudes of two forces acting at point is 18 and the magnitude of their resultant is 12. If the resultant is at 90° with the force of smaller magnitude, what are the magnitudes of forces?

(*a*) 12,5 (*b*) 14,4 (*c*) 5,13 (*d*) 10,8

59. If $\vec{A} = 2i - 4\hat{j} + 3\hat{k}; \vec{B} = 4\hat{i} - 8\hat{j} + 6\hat{k}$ find Angle b/w $\vec{A}$ & $\vec{B}$

(*a*) Zero (*b*) $9\hat{i}$ (*c*) $6\hat{i}$ (*d*) Can't find

60. Find the resultant of three vectors $\overrightarrow{OA}$, $\overrightarrow{OB}$ and $\overrightarrow{OC}$ shown in the following figure. Radius of the circle is R.



(*a*) 2R (*b*) $R(1+\sqrt{2})$

(*c*) $R\sqrt{2}$ (*d*) $R(\sqrt{2}-1)$

61. **Assertion (A):** Minimum number of vectors having unequal magnitude in a plane required to give zero resultant is three.

Reason (R): If vector addition of three vectors is zero, then they must lie in a plane

(*a*) If both Assertion (A) & Reason (R) are True & the Reason (R) is a correct explanation of the Assertion (A)

(*b*) If both Assertion (A) & Reason (R) are True but Reason (R) is not a correct explanation of the Assertion (R)

(*c*) If Assertion (A) is True but the Reason (R) is False

(*d*) If both Assertion (A) & Reason (R) are false.

62. Two vectors $\vec{A}$ and $\vec{B}$ are acting in the same plane and vector $\vec{C}$ is perpendicular to the plane. The resultant of these vectors -

(*a*) May be zero

(*b*) can not be zero

(*c*) lies between $\vec{A}$ and $\vec{B}$

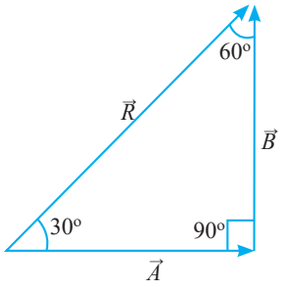
(*d*) lies between $\vec{A}$ and $-\vec{B}$

63. If the Result of *n* forces of different magnitudes acting at a point is zero, then the minimum value of n is

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

64. If resultant of two vector makes 30° and 60° with these vectors and has a magnitude of 40 units, then find magnitude of these vectors.



65. Which of the following set of 3 force can keep the object in equilibrium?

(*a*) 3, 4, 8 (*b*) 2, 5, 1

(*c*) 7, 3, 11 (*d*) 4, 5 ,8

66. Two vectors acting through a point are in the ratio 3 : 5. If the angle between them is 60° and the magnitude of their resultant is 35, find the magnitude of vectors.

67. Two forces acting in opposite direction have resultant 10 N and when acting perpendicularly have resultant 50 N. Find the magnitude of forces.

68. If $\vec{a},\vec{b}$ and $\vec{c}$ be three vectors such that $\vec{a}+\vec{b}+\vec{c}=0$ and $|\vec{a}|=3,|\vec{b}|=5,|\vec{c}|=7|$, find the angle between $\vec{a}$ and $\vec{b}$

69. A particle is being acted upon by four forces of 30 N due east, 20 N due north, 50 N due west and 40 N due south. The resultant force will be

(*a*) $20\sqrt{2}$ N, 60° south to west

(*b*) $20\sqrt{2}$ N, 45° south west

(*c*) $20\sqrt{2}$ N, 45° north to east

(*d*) $20\sqrt{2}$ N, 45° south to east

70. How many minimum numbers of non-zero vectors in different planes can be added to give zero resultant?

(*a*) 2 (*b*) 3

(*c*) 4 (*d*) 5

71. Three forces F_1, F_2 and F_3 together keep a body in equilibrium. If $F_1 = 3$ N along the positive *x*– axis, $F_2 = 4$ N along the positive y-axis, then the third force F_3 is

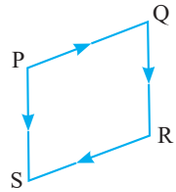
(*a*) 5 N making an angle $\theta=\tan^{-1}\left(\frac{3}{4}\right)$ negative *y*-axis

(*b*) 5 N making an angle $\theta=\tan^{-1}\left(\frac{4}{3}\right)$ with negative y-axis

(*c*) 7 N making an angle $\theta=\tan^{-1}\left(\frac{3}{4}\right)$ with negative *y* - axis

(*d*) 7 N making an angle $\theta=\tan^{-1}\left(\frac{4}{3}\right)$ with negative y-axis

72. In the given diagram, if PQ = A, QR = B and RS = C, then PS equals



(*a*) A – B + C (*b*) A + B – C

(*c*) A + B + C (*d*) A – B – C

73. Tl two vectors $\vec{A}$ and $\vec{B}$ are draw from a common Int and $\vec{C}=\vec{A}+\vec{B}$, then angle between $\vec{A}$ and $\vec{B}$ is

(i) 90° if $C^2 = A^2 + B^2$

(ii) Greater than 90° if $C^2 < A^2 + B^2$

(iii) Greater than 90° if $C^2 > A^2 + B^2$

(iv) Less than 90° if $C^2 > A^2 + B^2$

Correct option are –

(*a*) 1, 2 (*b*) 1, 2, 3, 4

(*c*) 2,3,4 (*d*) 1, 2, 4

74. Let $\vec{C}=\vec{A}+\vec{B}$.

(*a*) $|\vec{C}|$ is always greater than

(*b*) It is possible to have $|\vec{C}|<|\vec{A}|$ and $|\vec{C}|<|\vec{B}|$

(*c*) C is always equal to A + B

(*d*) C is never equal to A + B

75. A particle is being acted upon by four forces of 30 N due east, 20 N due north, 50 N due west and 40 N due south. The resultant force will be

(*a*) $20\sqrt{2}$ N, 60° south to west

(*b*) $20\sqrt{2}$ N, 45° south west

(*c*) $20\sqrt{2}$N, 45° north to east

(*d*) $20\sqrt{2}$ N, 45° south to east

76. Two vectors of magnitudes 4 and 6 are acting through a point. If the magnitude of the resultant is *R*

(*a*) $4 < R < 6$ (*b*) $4 < R < 10$

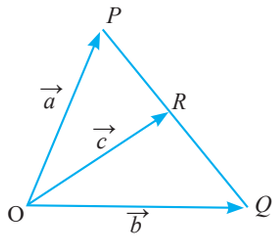
(*c*) $2 \le R \le 10$ (*d*) $2 \ge R \ge 10$

77. The resultant of A and B makes an angle α with A and β with B,

(*a*) $\alpha < \beta$ if $A > B$ (*b*) $\alpha < \beta$ if $A < B$

(*c*) $\alpha > \beta$ if $A > B$ (*d*) $\alpha < \beta$ if $A = B$

78. Figure shows three vectors $\vec{a},\vec{b}$, and $\vec{c}$, here R is the mid point of PQ. Which of the following relations is correct?



(*a*) $\vec{a}+\vec{b}=\vec{c}$ (*b*) $\vec{a}+\vec{b}=2\vec{c}$

(*c*) $\vec{a}-\vec{b}=\vec{c}$ (*d*) $\vec{a}-\vec{b}=2\vec{c}$

79. If two equal magnitude force F_0 are acting on particle and angle between them is given in column-I and their resultant in column-II then match the column and select correct option.

Column-I		Column-II	
(A)	0°	(P)	$F_0\sqrt{3}$
(B)	90°	(Q)	F_0
(C)	60°	(R)	$2F_0$
(D)	120°	(S)	$F_0\sqrt{2}$

	A	B	C	D
(*a*)	R	Q	P	S
(*b*)	R	P	S	Q
(*c*)	R	S	Q	P
(*d*)	R	S	P	Q

80. **Assertion (A):** If vector $\vec{A},\vec{B}$ and $\vec{C}$ are coplanar, then $\vec{A}+\vec{B}+\vec{C}$ must be zero.

Reason (R): $\vec{C}$ always cancel resultant of $\vec{A}$ and $\vec{B}$.

Choose correct alternative :

(*a*) If both are correct and Reason (R) is correct explanation for Assertion (A).

(*b*) If both are correct and Reason (R) is not correct explanation for Assertion (A).

(*c*) If Assertion (A) is correct, Reason (R) is incorrect.

(*d*) If both Assertion (A) and Reason (R) are incorrect.

81. What displacement must be added to the displacement $\left(-9\hat{i}+3\hat{j}\right)$ to produce a net displacement of 6 m, pointing in the negative x-direction?

(*a*) $3\hat{i}+3\hat{j}$ (*b*) $3\hat{i}-3\hat{j}$

(*c*) $-3\hat{i}+3\hat{j}$ (*d*) $-3\hat{i}-3\hat{j}$

Vector Subtraction

82. Two vector of same magnitude and angle between them is θ then find magnitude of vector subtraction.

83. The vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A}+\vec{B}|=|\vec{A}-\vec{B}|$. The angle between the two vectors is

(*a*) 45° (*b*) 90° (*c*) 60° (*d*) 75°

84. The Resultant of $\vec{A}+\vec{B}$ is $\vec{R}_1$ On reversing the vector $\vec{B}$, the resultant becomes $\vec{R}_2$ what is the value of $\vec{R}_1^2+\vec{R}_2^2$

(*a*) A^2+B^2 (*b*) A^2-B^2

(*c*) $2\left(A^2+B^2\right)$ (*d*) $2\left(A^2-B^2\right)$

85. Two vectors $\vec{A}$ and $\vec{B}$ have equal magnitudes. If Magnitude of $\vec{A}+\vec{B}$ is equal to two times the magnitude of $\vec{A}-\vec{B}$, then angle between $\vec{A}$ and $\vec{B}$ will be:

(*a*) $\sin^{-1}(3/5)$ (*b*) $\sin^{-1}(1/3)$

(*c*) $\cos^{-1}(3/5)$ (*d*) $\cos^{-1}(1/3)$

86. If the sum of two unit vectors is a unit vector, then the magnitude of their difference is:

(*a*) $\sqrt{3}$ (*b*) $\sqrt{2}$ (*c*) $\sqrt{5}$ (*d*) $\frac{1}{\sqrt{2}}$

87. Which of the following relations is True for two unit vectors $\left(\frac{\vec{A}}{A}\right)$ and $\left(\frac{\vec{B}}{B}\right)$ making an angle θ to each other?

(*a*) $|\hat{A}+\hat{B}|=|\hat{A}-\hat{B}|\tan(\theta/2)$

(*b*) $|\hat{A}-\hat{B}|=|\hat{A}+\hat{B}|\tan(\theta/2)$

(*c*) $|\hat{A}+\hat{B}|=|\hat{A}-\hat{B}|\cos\left(\hat{\theta}/2\right)$

(*d*) $|\hat{A}-\hat{B}|=|\hat{A}+\hat{B}|\cos(\theta/2)$

88. For two vector $\vec{A}$ and $\vec{B}$ vector addition $\vec{R}=\vec{A}+\vec{B}$ and vector subtraction $\vec{D}=\vec{A}-\vec{B}$ then angle between $\vec{A}$ and $\vec{B}$.

Condition

(*i*) $|\vec{A}+\vec{B}|=|\vec{R}|=|\vec{A}|=|\vec{B}|$ .....

(*ii*) $|\vec{A}|=|\vec{B}|=|\vec{A}-\vec{B}|$ .....

(*iii*) $A^2+B^2=|\vec{A}-\vec{B}|^2=D^2$ .....

(*iv*) $A^2+B^2=R^2$ .....

(*v*) $|\vec{A}+\vec{B}|=|\vec{A}-\vec{B}|=\theta$ .....

(*vi*) $|\vec{A}+\vec{B}|=|\vec{A}|+|\vec{B}|$ .....

(*vii*) $|\vec{A}-\vec{B}|=|\vec{A}|+|\vec{B}|$ .....

(*viii*) $|\vec{A}+\vec{B}|=|\vec{A}|-|\vec{B}|$ .....

(*ix*) $|\vec{A}-\vec{B}|=|\vec{A}|-|\vec{B}|$ .....

89. The vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A}+\vec{B}|=|\vec{A}|=|\vec{B}|$, then $|\vec{A}-\vec{B}|$ may be equated to

(*a*) $\frac{\sqrt{3}}{2}\vec{A}$ (*b*) $\vec{A}$

(*c*) $3\sqrt{2}|A|$ (*d*) $\sqrt{3}|A|$

90. When vector $\vec{A}=2\hat{i}+3\hat{j}+2\hat{k}$ is subtracted from vector $\vec{B}$, it gives a vector equal to $2\hat{j}$. Then magnitude of vector $\vec{B}$ will be:

(*a*) 3 (*b*) $\sqrt{33}$

(*c*) $\sqrt{6}$ (*d*) $\sqrt{5}$

91. Majnu Majedar is moving with 6 m/s in east and Ramlal is moving with 6 m/s at 30° east of North, then find relative velocity of Ramlal w.r.t. MJ.

92. Initial velocity of Ramlal is 5 m/s in north after some time it is moving 5 m/s in east then find

(*i*) Change in velocity

(*ii*) Magnitude of change in velocity

(*iii*) Change in magnitude of velocity

93. If initial velocity of object $\vec{u}=3\hat{i}+4\hat{j}$ and after some time it's velocity $\vec{v}=4\hat{i}+3\hat{j}$ then final

(*i*) Magnitude of change in velocity

(*ii*) Change in Magnitude of velocity

94. If two vector $\vec{A}$ & $\vec{B}$ such that $(\vec{A}+\vec{B})$ is perpendicular to the difference $\vec{A}-\vec{B}$ then ratio of magnitude $\frac{|\vec{A}|}{|\vec{B}|}$

95. Find position vector of A(1,2,1) w.r.t. point B(-1, 2, 0) and (1,4,5) w.r.t. (2,3,5).

96. If a student moves as given below:

(*i*) 50 m in East

(*ii*) 20 m in North

(*iii*) $40\sqrt{2}$ m in S-E direction. Find net Displacement?

97. If $\vec{A}+\vec{B}=\vec{A}-\vec{B}$ then which of the following option will be correct?

(*a*) Magnitude of $\vec{A}$ may be zero.

(*b*) Magnitude of $\vec{B}$ must be zero.

(*c*) Angle between $\vec{A}$ and $\vec{B}$ must be 90°

(*d*) Angle between $\vec{A}$ and $\vec{B}$ may be 90°

98. The length of the second's hand in a watch is 1 cm. The magnitude of the change in the velocity of its tip is 15 s is

(*a*) Zero (*b*) $\pi/30$ cm / s

(*c*) $(\pi/30)\sqrt{2}$ cm / s (*d*) $\pi/30\sqrt{2}$ cm / s

99. A particle moving with a speed of *v* changes direction by an angle θ, without change in speed.

(i) The change in the magnitude of its velocity is zero.

(ii) The change in the magnitude of its velocity is 2 *v* sin θ/2.

(iii) The magnitude of the change in its velocity is 2 *v* sin θ/2.

(iv) The magnitude of the change in its velocity is *v* (1 – cos θ).

(*a*) (i), (ii) (*b*) (i), (iii)

(*c*) (i), (ii), (iii) (*d*) all

100. A truck travelling due north at 20 m/s turns west and travels at the same speed. What is the change in the velocity?

(*a*) 40 m/s NW (*b*) 40 m/s SW

(*c*) $20\sqrt{2}$ m / s NW (*d*) $20\sqrt{2}$ m / s SW

101. A particle moves towards east with a speed 5 m/s. After 10 s its direction changes towards north with the same speed. The average acceleration of the particle is

(*a*) Zero (*b*) $\frac{1}{\sqrt{2}}$ m / s^2 N – W

(*c*) $\frac{1}{\sqrt{2}}$ m / s^2 N – E (*d*) $\frac{1}{\sqrt{2}}$ m / s^2 S – W

102. For two vectors A and B, $|\vec{A}+\vec{B}|=|\vec{A}-\vec{B}|$ is always true when :

(i) $|A| = |B| \neq 0$

(ii) A ⊥ B

(iii) $|A| = |B| \neq 0$ and *A* and *B* are parallel or antiparallel

(iv) when either |A| or |B| is zero.

(*a*) Only (ii) is correct.

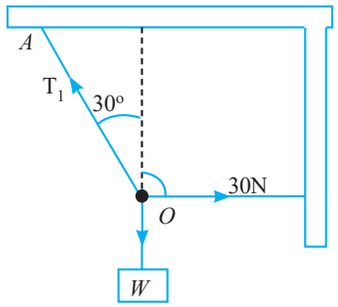
(*b*) Only (iv) is correct.

(*c*) Both (ii) and (iv) are correct.

(*d*) (i), (ii) and (iv) are correct.

Lami's Theorem

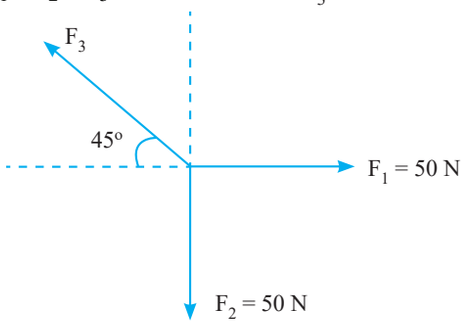
103. As shown in figure tension in the horizontal cord is 30N. The weight W and tension in the string OA in Newton are



(*a*) $30\sqrt{3}, 30$ (*b*) $30\sqrt{3}, 60$

(*c*) $60\sqrt{3}, 30$ (*d*) None of these

104. If $\vec{F_1}+\vec{F_2}+\vec{F_3}=0$ find value of F_3?



Multiplication of Vector with Scalar

105. If $\vec{A}$ and $\alpha\vec{A}$ will be parallel to each other then α must be
(*a*) Positive (*b*) Negative
(*c*) Zero (*d*) None of these

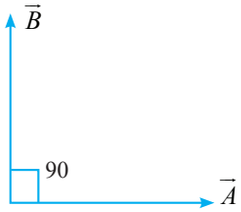
106. $\vec{A}$ is a vector of magnitude 2.7 units due east. What is the magnitude and direction of vector $4\vec{A}$?
1 units due east
(*a*) 4 units due east (*b*) 4 units due west
(*c*) 2.7 units due east (*d*) 10.8 units due east

Dot Product

107. If $|\vec{A}|=2$ and $|\vec{B}|=4,\theta=60^\circ$ then find $\vec{A}\cdot\vec{B}$.

108. If $\vec{A}=2\hat{i}+3\hat{j}-4\hat{k}$, $\vec{B}=-2\hat{i}+4\hat{j}+2\hat{k}$, then find $\vec{A}\cdot\vec{B}$

109. If $\vec{A}\,\&\,\vec{B}$ is perpendicular to each other (orthogonal) then find their dot product



110. Which of the following vectors is/are perpendicular to the vector $4\hat{i}-3\hat{j}$?
(*a*) $4\hat{i}+3\hat{j}$ (*b*) $6\hat{i}$
(*c*) $7\hat{k}$ (*d*) $3\hat{i}-4\hat{j}$

111. Three vectors $\vec{A},\vec{B}$ and $\vec{C}$ satisfy the relation $\vec{A}\cdot\vec{B}=0$ and $\vec{A}\cdot\vec{C}=0$. The vector A is parallel to
(*a*) $\vec{B}$ (*b*) $\vec{C}$ (*c*) $\vec{B}\cdot\vec{C}$ (*d*) $\vec{B}\times\vec{C}$

112. Vector which is perpendicular to $\left(a\cos\theta\hat{i}+b\sin\theta\hat{j}\right)$ is
(*a*) $b\cos\theta\hat{i}-a\sin\theta\hat{j}$ (*b*) $\frac{1}{a}\sin\theta\hat{i}-\frac{1}{b}\cos\theta\hat{j}$
(*c*) $5\hat{k}$ (*d*) All of these

Application of Dot Product

113. If $\vec{A}=\hat{i},\vec{B}=\hat{i}+3\hat{j}$, then find angle between $\vec{A}$ and $\vec{B}$

114. If $\vec{A}=2\hat{i}+2\hat{j}$ and $\vec{B}=2\hat{i}-2\hat{j}$ then find angle between $\vec{A}$ and $\vec{B}$

115. If $\vec{A}=2\hat{i}+6\hat{j}+3\hat{k}$ and $\vec{B}=4\hat{i}$. Find angle between $\vec{A}$ and $\vec{B}$.

116. The angle between the two vectors $\vec{A}=3\hat{i}+4\hat{j}+5\hat{k}$ and $\vec{B}=3\hat{i}+4\hat{j}-5\hat{k}$ will be
(*a*) 90° (*b*) 180° (*c*) Zero (*d*) 45°

117. If $\vec{A}=0.5\hat{i}+0.4\hat{j}-\alpha\hat{k}$ then find α if $\vec{A}$ is unit vector.

118. If $\vec{A}=0.6\hat{i}+\beta\hat{j}$ is a unit vector then, find value of 'β'
(*a*) 0.4 (*b*) 0.8 (*c*) 0.7 (*d*) 0.6

119. If vector $\vec{A}=\cos\omega t\,\hat{i}+\sin\omega t\,\hat{j}$ and $\vec{B}=\cos\frac{\omega t}{2}\hat{i}+\sin\frac{\omega t}{2}\hat{j}$ are function of time, then the value of *t* is at which they are orthogonal to eachother is
(*a*) $t=\pi/\omega$ (*b*) $t=0$
(*c*) $t=\pi/4\omega$ (*d*) $t=\pi/2\omega$

120. If a vector $2\hat{i}+3\hat{j}+8\hat{k}$ is perpendicular to the vector $3\hat{j}-4\hat{i}+\alpha\hat{k}$, then the value of α is
(*a*) 1/2 (*b*) -1/2 (*c*) 1 (*d*) -1
(*e*) -1/8

121. What will be the projection of Vector $\vec{A}=\hat{i}+\hat{j}+\hat{k}$ on Vector $\vec{B}=\hat{i}+\hat{j}$?
(*a*) $\sqrt{2}\left(\hat{i}+\hat{j}+\hat{k}\right)$ (*b*) $\left(\hat{i}+\hat{j}\right)$
(*c*) $\sqrt{2}\left(\hat{i}+\hat{j}\right)$ (*d*) $2\left(\hat{i}+\hat{j}+\hat{k}\right)$

122. A particle moves from point $\left(-2\hat{i}+5\hat{j}\right)$ to $\left(4\hat{i}+3\hat{j}\right)$ when a force of $\left(4\hat{i}+3\hat{j}\right)$N is applied. How much work has been done by force?
(*a*) 5*j* (*b*) 2*j* (*c*) 18*j* (*d*) 11*j*

123. A body, constrained to move in *y* - direction, is subjected to a force given by $\vec{F}=\left(-2\hat{i}+15\hat{j}+6\hat{k}\right)$N. The work done by this force in moving the body through a distance of along $10\hat{j}$ m y -axis, is
(*a*) 105 J (*b*) 20J (*c*) 190 J (*d*) 150 J

124. Two forces $\vec{F_1}=\hat{i}+2\hat{j}-2\hat{k}$ and $\vec{F_2}=2\hat{i}+2\hat{j}+3\hat{k}$ are acting on a particle and it's displacement is $-\hat{i}+2\hat{j}+\hat{k}$. Find work done on the particle
(*a*) 2J (*b*) 6J (*c*) -3J (*d*) Zero

125. If $\vec{a}=2\hat{i}+2\hat{j}+\hat{k},\vec{b}=-\hat{i}+\hat{j}+2\hat{k}$ and $\vec{c}=3\hat{i}+\hat{j}$ such that $\vec{a}+\lambda\vec{b}$ is perpendicular to $\vec{c}$, find λ.

Cross Product

126. Position of particle is given by $\vec{r} = \hat{i} + 2\hat{j} - \hat{k}$ and momentum $\vec{p} = 3\hat{i} + 4\hat{j} - 2\hat{k}$. The angular momentum is perpendicular to

(*a*) x - axis

(*b*) z - axis

(*c*) y - axis

(*d*) line at equal to all three axis

127. If $\vec{F}$ is the force acting on particle having position vector $\vec{r}$ and $\vec{\tau}$ to the torque of this force about origin, then

(*a*) $\vec{r}\cdot\vec{\tau} > 0$ and $\vec{f}\cdot\vec{\tau} < 0$ (*b*) $\vec{r}\cdot\vec{\tau} = 0$ and $\vec{f}\cdot\vec{\tau} \neq 0$

(*c*) $\vec{r}\cdot\vec{\tau} = 0$ and $\vec{f}\cdot\vec{\tau} = 0$ (*d*) $\vec{\tau}\cdot\vec{\tau} \neq 0$ and $\vec{f}\cdot\vec{\tau} = 0$

128. If $\vec{A}$ and $\vec{B}$ are two vectors satisfying the relation $\vec{A}\cdot\vec{B} = |\vec{A}\times\vec{B}|$ Then the value of $|\vec{A}-\vec{B}|$ will be:

(*a*) $\sqrt{A^2+B^2+\sqrt{2}AB}$ (*b*) $\sqrt{A^2+B^2}$

(*c*) $\sqrt{A^2+B^2-\sqrt{2}AB}$ (*d*) $\sqrt{A^2+B^2+2AB}$

129. $\vec{A}$ is a vector Quantity such that $|\vec{A}| =$ non zero constant which of the following expression is true for $\vec{A}$?

(*a*) $\vec{A}\cdot\vec{A} = 0$ (*b*) $\vec{A}\times\vec{A} = 0$

(*c*) $\vec{A}\times\vec{A} < 0$ (*d*) $\vec{A}\times\vec{A} > 0$

130. **Assertion (A):** $\vec{A}\times\vec{B}$ is perpendicular to both $|\vec{A}+\vec{B}|$ as well as $|\vec{A}-\vec{B}|$

Reason (R): $\vec{A}+\vec{B}$ as well as $\vec{A}-\vec{B}$ lie in plane containing $\vec{A}$ and $\vec{B}$, but $\vec{A}\times\vec{B}$ lies perpendicular to the plane containing $\vec{A}$ and $\vec{B}$.

(*a*) Assertion (A) is false but Reason (R) is true

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is NOT the correct explanation of Assertion (A)

(*c*) Assertion (A) is true but Reason (R) is false

(*d*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

131. For three vector $\vec{A} = (-x\hat{i} - 6\hat{j} - 2\hat{k}), \vec{B} = (-\hat{i} + 4\hat{j} + 3\hat{k})$ and $\vec{C} = (-8\hat{i} - \hat{j} + 3\hat{k})$ if $\vec{A}\cdot(\vec{B}\times\vec{C}) = 0$ then value of x is_____.

132. If $|\vec{a}| = \sqrt{26}, |\vec{b}| = 7$, and $|\vec{a}\times\vec{b}| = 35$. Find $\vec{a}\cdot\vec{b}$

133. $\vec{a} = 3\hat{i} + 2\hat{k}, \vec{b} = 3\hat{j} - 4\hat{k}$ and $\vec{c} = \hat{i} + \hat{j} + \hat{k}$. Find $(\vec{a}\times\vec{b})\cdot\vec{c}$

134. Two adjacent sides of a parallelogram are represented by the two vectors $\hat{i} + 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$. What is the area of parallelogram?

(*a*) 8 (*b*) $8\sqrt{3}$

(*c*) $3\sqrt{8}$ (*d*) 192

135. If $\vec{A}\times\vec{B} = \vec{C}$, then which of the following statements is wrong

(*a*) $\vec{C}\perp\vec{A}$ (*b*) $\vec{C}\perp\vec{B}$

(*c*) $\vec{C}\perp(\vec{A}+\vec{B})$ (*d*) $\vec{C}\perp(\vec{A}\times\vec{B})$

136. The magnitude of the vector product of two vectors A and B may not be

(*a*) greater than AB (*b*) equal to AB

(*c*) less than AB (*d*) equal to zero

137. A vector $\vec{A}$ points vertically upward and $\vec{B}$ points towards north. The vector product $\vec{A}\times\vec{B}$ is

(*a*) Zero (*b*) Along west

(*c*) Along east (*d*) Vertically downward

138. The value of $(\vec{A}+\vec{B})\times(\vec{A}-\vec{B})$ is

(*a*) 0 (*b*) $A^2 - B^2$ (*c*) $\vec{B}\times\vec{A}$ (*d*) $2(\vec{B}\times\vec{A})$

139. The scalar product of two vectors is $2\sqrt{3}$ and the magnitude of their cross product is 2. The angle between them is

(*a*) 30° (*b*) 45° (*c*) 60° (*d*) 90°

140. A vector $\vec{A}$ points vertically upward and $\vec{B}$ points towards north. The vector product $\vec{A}\times\vec{B}$ is

(*a*) Zero (*b*) Along west

(*c*) Along east (*d*) Vertically downward

141. If $\vec{P}\times\vec{Q} = \vec{P}\times\vec{R}$ then which of the following is correct?

(*a*) $\vec{Q}$ must be equal to $\vec{R}$

(*b*) $|\vec{Q}|$ must be equal to $|\vec{R}|$

(*c*) There may be infinite solution for the equation

(*d*) Only one solution is possible

Answer Key

1. (*c*) **2.** (*c*) **3.** (*c*) **4.** (*d*)

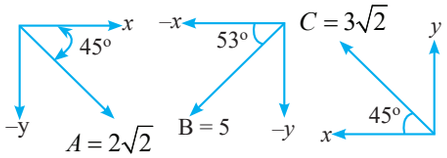
5. Magnitude: (i) Must be equal, (ii) May be equal, (iii) May be equal, (iv) May be equal, Direction Angle: (i) 0º, (ii) 90º, (iii) 0º, (iv) 180º

6. (*d*) **7.** (*a*) **8.** (*b*) **9.** (*a*) **10.** (*c*) **11.** (i) $\sqrt{13}$, (ii) 5, (iii) $5\sqrt{2}$, (iv) $\sqrt{3}$, (v) $=10\sqrt{2}$, (vi) $10\sqrt{3}$

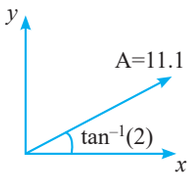
12. (i) $2\sqrt{3}$, (ii) $5\sqrt{2}$, (iii) $25\sqrt{5}$, (iv) $10\sqrt{2}$, (v) 13, (vi) 2, (vii) $\sqrt{3}$, (viii) $10\sqrt{2}$, (ix) $2\sqrt{2}$ **13.** 2 **14.** (*a*) **15.** (*c*)

16. (*c*) **17.** (*b*) **18.** $6\hat{i}+8\hat{j},53$ **19.** $\vec{C}=\frac{3}{\sqrt{6}}\left(\hat{i}+\hat{3}+2\hat{k}\right)$ **20.** (*b*) **21.** (*c*)

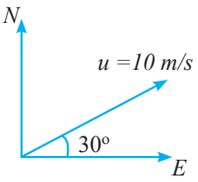
22. (*a*) **23.** (*c*) **24.**



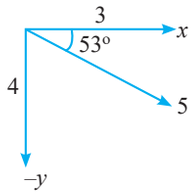
25.



26.



27.



28. (*b*) **29.** (*d*) **30.** a-iv, b-iii, c-i, d-ii **31.** (i) 7, (ii) $\sqrt{37}$, (iii) 5, (iv) $\sqrt{13}$, (v) 1

32. (*c*) **33.** (*d*) **34.** (*a*) **35.** (*c*) **36.** (*c*) **37.** (*a*) **38.** (*b*) **39.** (*d*) **40.** (*a*) **41.** (*c*)

42. (*c*) **43.** (*d*) **44.** (*b*) **45.** (*c*) **46.** (*b*) **47.** (*a*) **48.** (*c*) **49.** (*d*) **50.** $F_{net} = F$ **51.** (*d*)

52. $-\hat{i}+5\hat{j}-\hat{k}$ **53.** (*d*) **54.** (*c*) **55.** (*a*) **56.** (*d*) **57.** $-3\vec{A}=-6i-9\hat{j}+12\hat{k},\frac{\vec{A}}{2}=\hat{i}+1.5\hat{j}-2\hat{k}$

58. (*c*) **59.** (*a*) **60.** (*b*) **61.** (*b*) **62.** (*b*) **63.** (*c*) **64.** $A=20\sqrt{3}$, B = 20 **65.** (*d*) **66.** (25, 15)

67. (30N, 40N) **68.** 60° **69.** (*b*) **70.** (*c*) **71.** (*c*) **72.** (*c*) **73.** (*d*) **74.** (*b*) **75.** (*b*)

76. (*c*) **77.** (*a*) **78.** (*b*) **79.** (*d*) **80.** (*d*) **81.** (*b*) **82.** $D=2A\sin\left(\frac{\theta}{2}\right)$ **83.** (*b*) **84.** (*c*)

85. (*c*) **86.** (*a*) **87.** (*b*) **88.** (*i*) 120°, (*ii*) 60°, (*iii*) 90°, (*iv*) 90°, (*v*) 90°, (*vi*) 0, (*vii*) 180°, (*viii*) 180°, (*ix*) 0° **89.** (*d*)

90. (*b*) **91.** 6 m/s **92.** (i) $5\sqrt{2}$ (South - East), (ii) $5\sqrt{2}$ (iii) 0 **93.** (*i*) 5 (*ii*) 0 **94.** Division of vectors is not allowed

95. $\sqrt{5},\sqrt{2}$ **96.** $90\hat{i}-20\hat{j}$ **97.** (*b*) **98.** (*c*) **99.** (*b*) **100.** (*d*) **101.** (*b*) **102.** (*c*) **103.** (*b*)

104. $50\sqrt{2}$ **105.** (*a*) **106.** (*d*) **107.** 4 **108.** 0 **109.** 0 **110.** (*d*) **111.** (*d*) **112.** (*d*) **113.** 60°

114. 90° **115.** $\cos^{-1}\left(\frac{2}{7}\right)$ **116.** (*a*) **117.** $\alpha=\sqrt{0.59}$ **118.** (*b*) **119.** (*a*) **120.** (*e*) **121.** (*b*)

122. (*c*) **123.** (*d*) **124.** (*b*) **125.** $\lambda = 4$ **126.** (*a*) **127.** (*c*) **128.** (*c*) **129.** (*b*) **130.** (*d*) **131.** $x = 4$

132. 7 **133.** (15) **134.** (*b*) **135.** (*d*) **136.** (*a*) **137.** (*b*) **138.** (*d*) **139.** (*a*) **140.** (*b*) **141.** (*c*)